UMCS and HVAC Control Systems

Criteria Update

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UFC / UFGS Criteria Update
- Development and Review Team -

- Development (U.S. Army Corps of Engineers):
  - Headquarters U.S. Army Corps of Engineers (HQUSACE)
  - Engineer Research Development Center, Construction Engineering Research Laboratory (ERDC-CERL)
  - Huntsville Center - Center of Expertise for UMCS
  - Savannah District - Center of Expertise for HVAC Control
- Review and coordination:
  - Air Force and Navy
  - Army Districts & Installations: Fort Worth District, Fort Hood, Fort Sill, Louisville District, others
  - Vendors and System Integrators

Products

Update criteria documents:

UFGS-15951: DDC for HVAC & Building-Level Controls
UFGS-13801: Utility Monitoring & Control Systems
UFC 3-400-02: Utility Monitoring & Control Systems
UFC 3-410-02: DDC for HVAC & Building-Level Controls

Update existing PROSPECT courses:

Crs 340: HVAC Control Systems: **Design**
Crs 382: HVAC Control Systems: **Quality Verification**
Crs 246: HVAC Control Systems: **O&M**

UMCS and HVAC Control Systems
- Problem -

- Increasing use of DDC in Army / Government
- Designers, construction QV, and O&M staff have difficulty dealing with multitude of options and complexities of DDC
- Design and spec criteria documents are out of date
  - 15951A is for stand-alone buildings
  - 13801A used for both building and UMCS, thus confusion with 15951A
  - Both specifications lead to closed, proprietary systems
- Government forced to attempt to integrate different closed and proprietary systems

UMCS and HVAC Control Systems
- Problem -

- Sole source procurement is prohibited in government contracts
- Competitive procurement under the current specifications leads to multiple single-vendor systems
- These single-vendor systems are not open (interoperable/ extensible) and result in added cost to integrate them
- Specifications to procure multi-vendor systems that are non-proprietary and open are needed

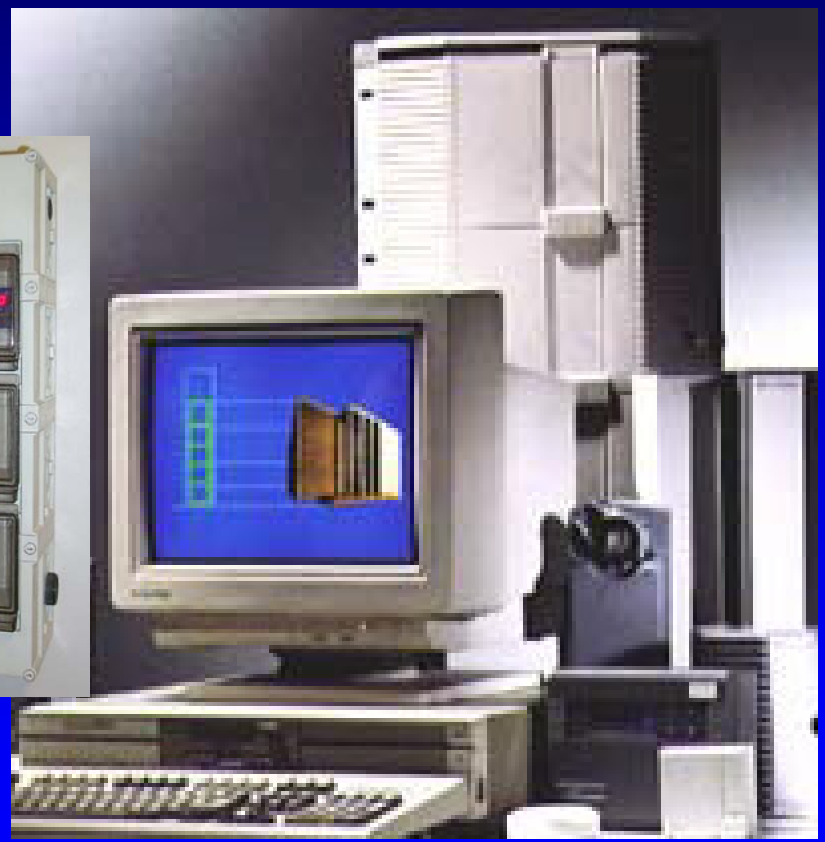
UMCS and HVAC Control Systems
- Definitions -

- Proprietary system: A system that requires sole-source procurement
- An open DDC system is characterized by the ability for any qualified entity to readily modify, operate, upgrade, and perform retrofits on the system. An open system:
  - Permits multiple devices from multiple vendors to readily exchange information
  - Provides the capability to easily replace any device with another device procured from multiple sources
  - May have components available from only one manufacturer, but represent a small percentage of the overall device
  - May have fees associated with the use of certain components, where the fees are established and consistent

Criteria Update
- Goals -

- Develop specifications for non-proprietary and open systems that meet the Corps' DDC system requirements
- Minimize complexity for:
  - Design
  - Construction
  - O&M (in-house or contracted)
- Provide support to our customers/users
  - Technical and management
  - Contracting
  - Training
- KISS

Corps Specifications



US Army Corps of Engineers

Engineer Research & Development Center

‘Old’ SLDC Specs
- Lessons Learned -

- It was difficult for industry to accept the custom technology. The solution should be commercial ‘off the shelf’.
- The concept while simple, was not simple enough. HVAC controls by their nature are complex and detailed. We need to maximize our support base.
- The SLDC control panels were not capable of cost-effectively interfacing with a supervisory system (such as a UMCS). The 15000 (building) and 13000 (UMCS) specifications must be written to work together.

- **With the new criteria we are incorporating these lessons to the maximum extent possible**

Note: SLDC = Single-Loop Digital Control

System Requirements

- Open/standard communications protocol
- Open network management/network database standard
- Simplify Operations and Maintenance
- Eliminate closed systems

These considerations are related, so the overall picture must be considered in deciding each

Open/Standard Communications Protocol

- Needed to permit/support competitive procurement
- ANSI-135 (BACnet®) and ANSI-709 (LonTalk®) are the primary open protocols available for building controls
- Industry consensus on choice of LonTalk / BACnet is impossible; both are functional/usable, with pros and cons

Open/Standard Communications Protocol

- USACE choice for current specs ANSI standard 709.1 (LonTalk)
  - There is an open network management/database standard designed to work with the protocol
  - Peer-to-peer communications helps eliminate the need for closed supervisory controllers
  - LONMARK® certification process in place / operational
  - 100's of certified devices available
  - Protocol reference implementation is available
  - LONMARK Interoperability Association vendor support
  - Advantage of high-speed IP (via ANSI/EIA 852)
  - Adoption & support by industries besides HVAC
- R&D is ongoing - Continuing to monitor other technologies (BACnet, SOAP, XML, etc.)

Open Network Management/Database Standard

- Needed to permit/support competitive procurement
- Multiple network management/database standards are available
- Industry consensus on the choice of a network management/database standard is impossible
- Corps can only support one; the most non-proprietary, open, supported and available option

Open Network Management/Database Standard

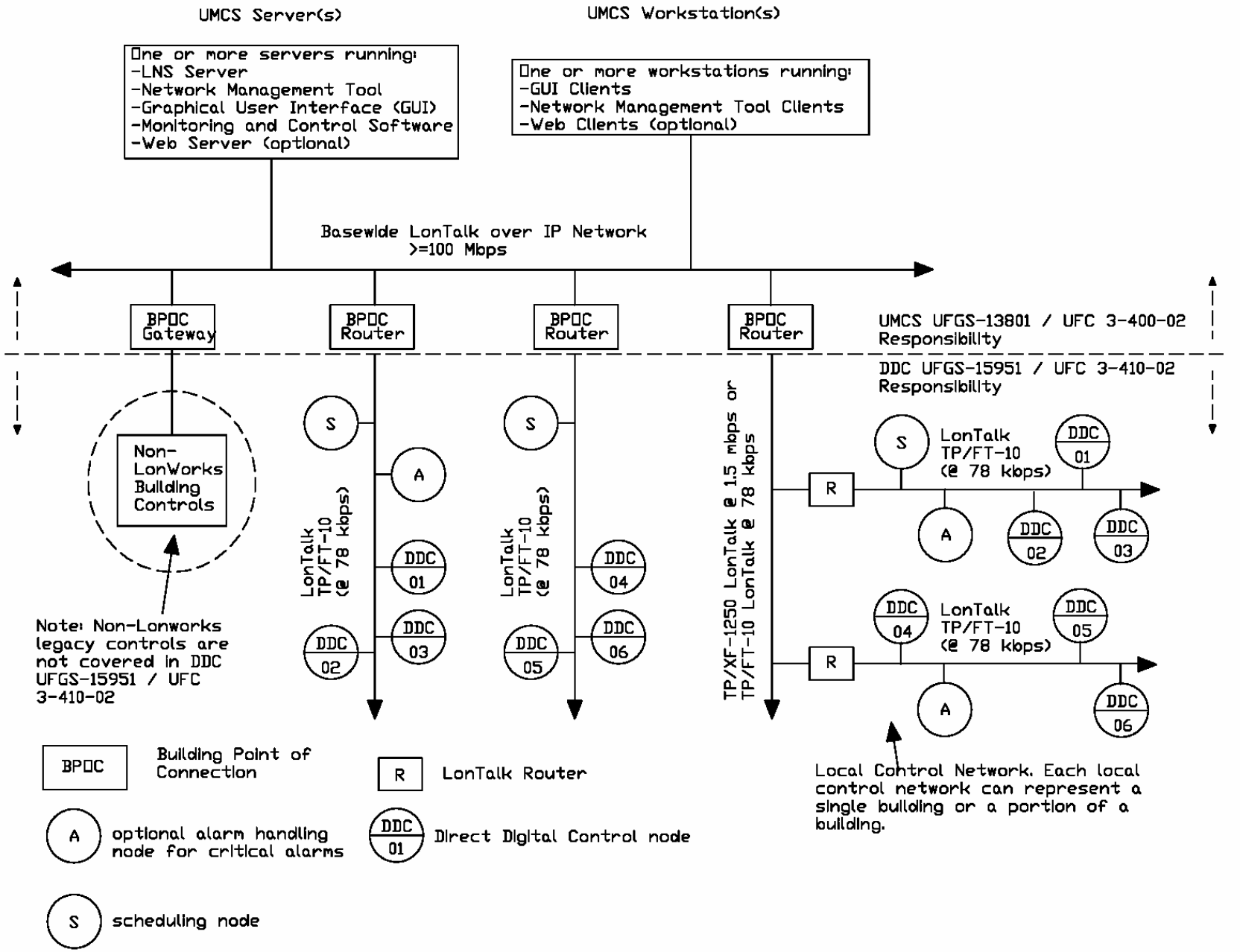
- Corps choice for current specs: LonWorks® Network Services (LNS)
  - Provides open access to network
  - Permits non-proprietary expansion/modifications to network
  - Adopted by multiple vendors; license available to any vendor
  - LNS-capable tools available to 3rd parties (not limited to proprietary channels)
  - Adoption & support by industries besides HVAC
- R&D is ongoing - Continuing to monitor other tools/approaches

Simple For Operation and Maintenance

- A single front-end
- Minimize required device/network configuration tools
- Multiple repair/replacement options (devices, vendors, contractors)
- Contracting and technical support

Eliminate Closes Systems

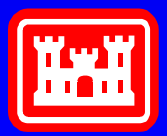
- Vendors often try to close the system to ‘lock-in’ the customer leading to proprietary procurement and/or costly system expansion
- Avoid devices/approaches that tend to close the system (ex: gateways, supervisory controllers)
- Avoid non-standard communications – including those reserved for supervisory tasks (ex: scheduling) since they introduce closed aspects
- Where no standard approach exists, specifications provide a standard approach
- Permit gateways for legacy system interface only



UMCS/DDC Network Architecture

Considerations

- The technology is still growing
- Certified controllers tend to have limited functionality, so the specifications must/will accommodate other options
- Controller application programming / configuration often performed through closed tools
- Scheduling, Trending, Alarming, Energy / Load Management are non-standardized functions
- UMCS Monitoring & Control software may have some proprietary aspects



Criteria Update
- Schedule -

- R&D - Ongoing through 2004 (and beyond)
- UFGS / UFC
  - Final UFGS (specs) **Fall 03**
  - Final UFC (design guidance) **Fall 03**
- Training courses **Fall 03**
  - Control System Design **Oct 03**
- Technical report **2004**

Criteria Update Summary

- Government philosophy: KISS
  - Our Inter-networking needs are not especially complex; need only basic functionality
  - Work with industry
  - Avoid bells and whistles
  - Make it easy to get working and keep it working
  - Keep it open (communications *and* our options)